

FIG. 1

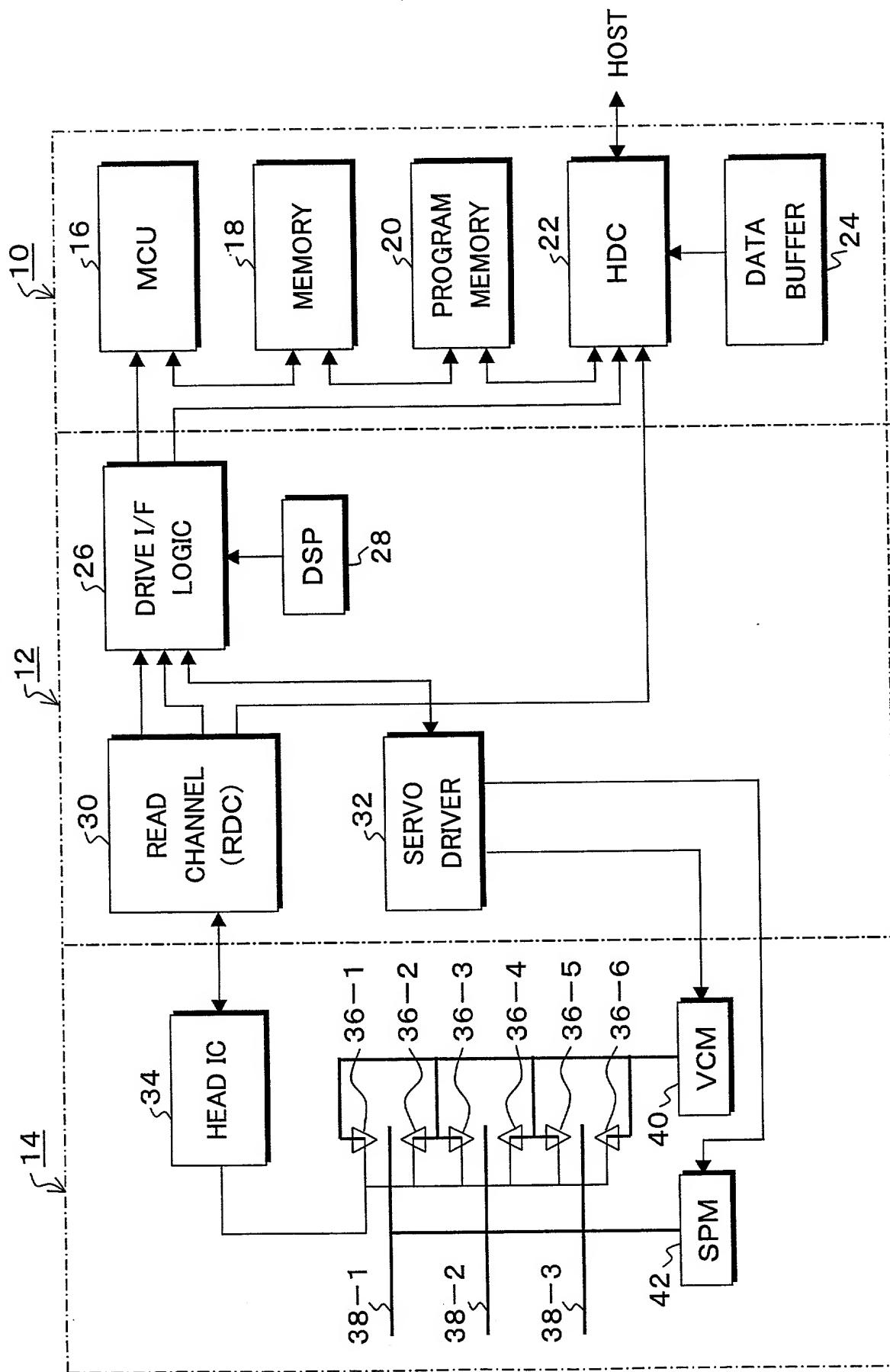
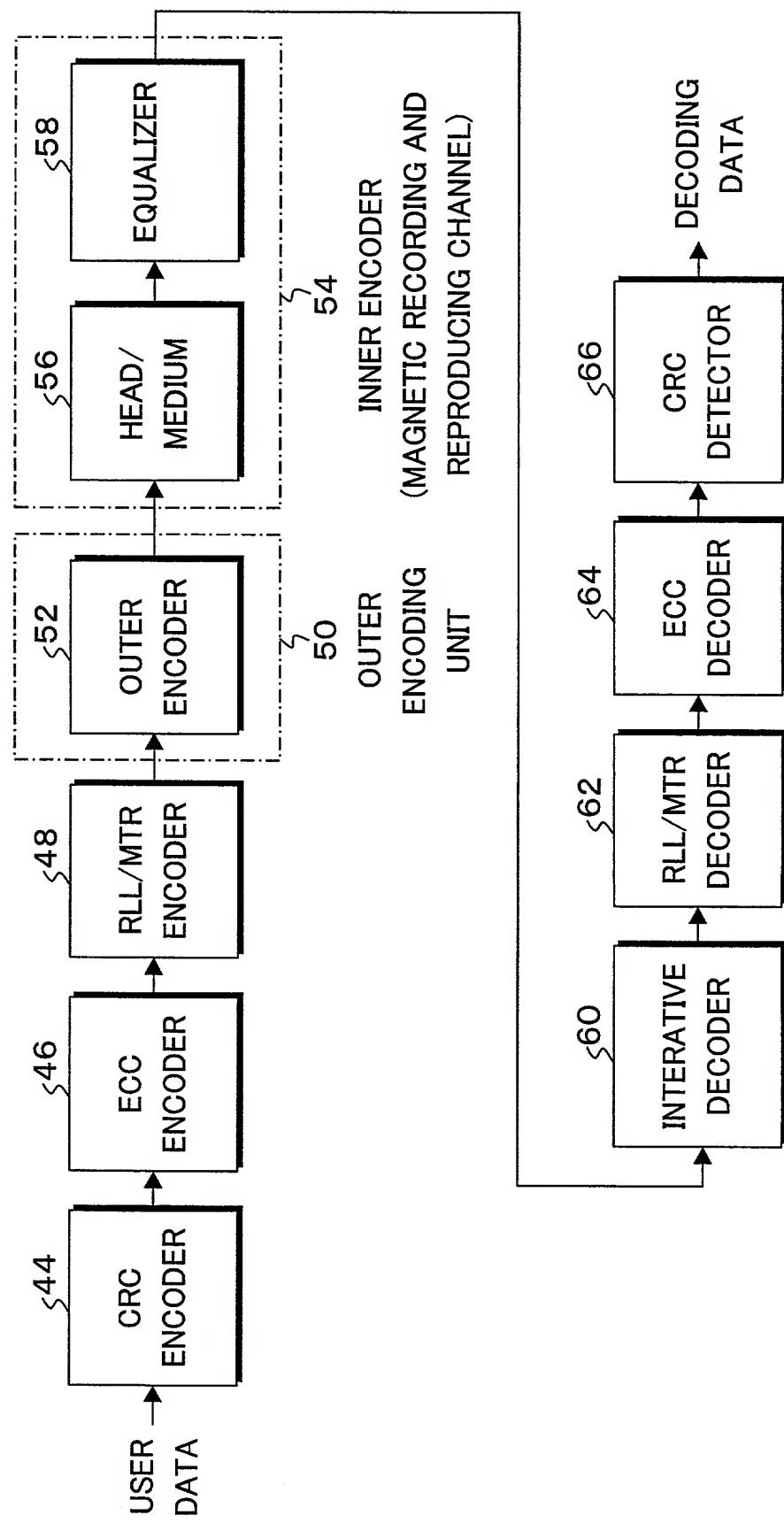


FIG. 2



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FIG. 3

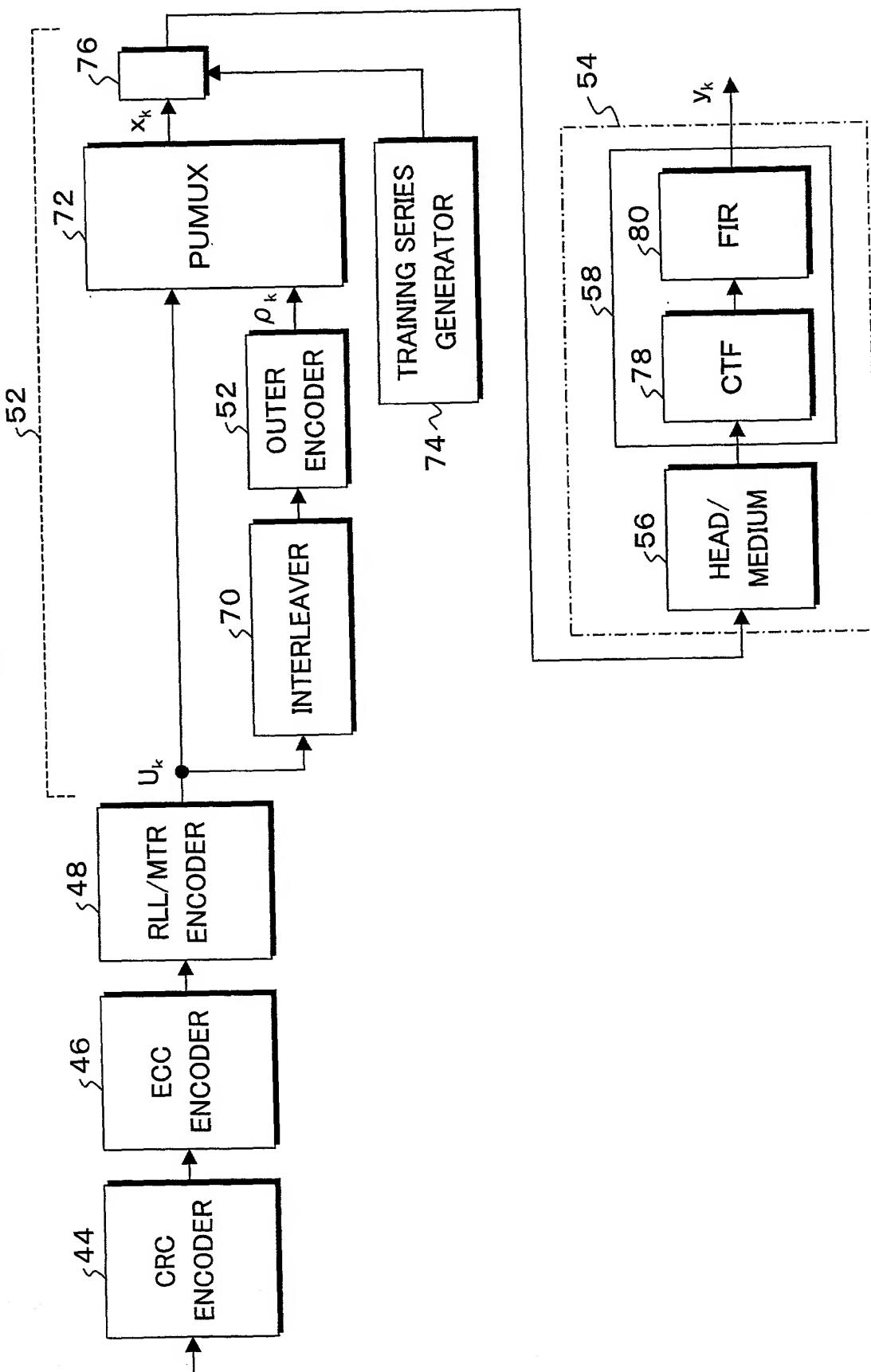
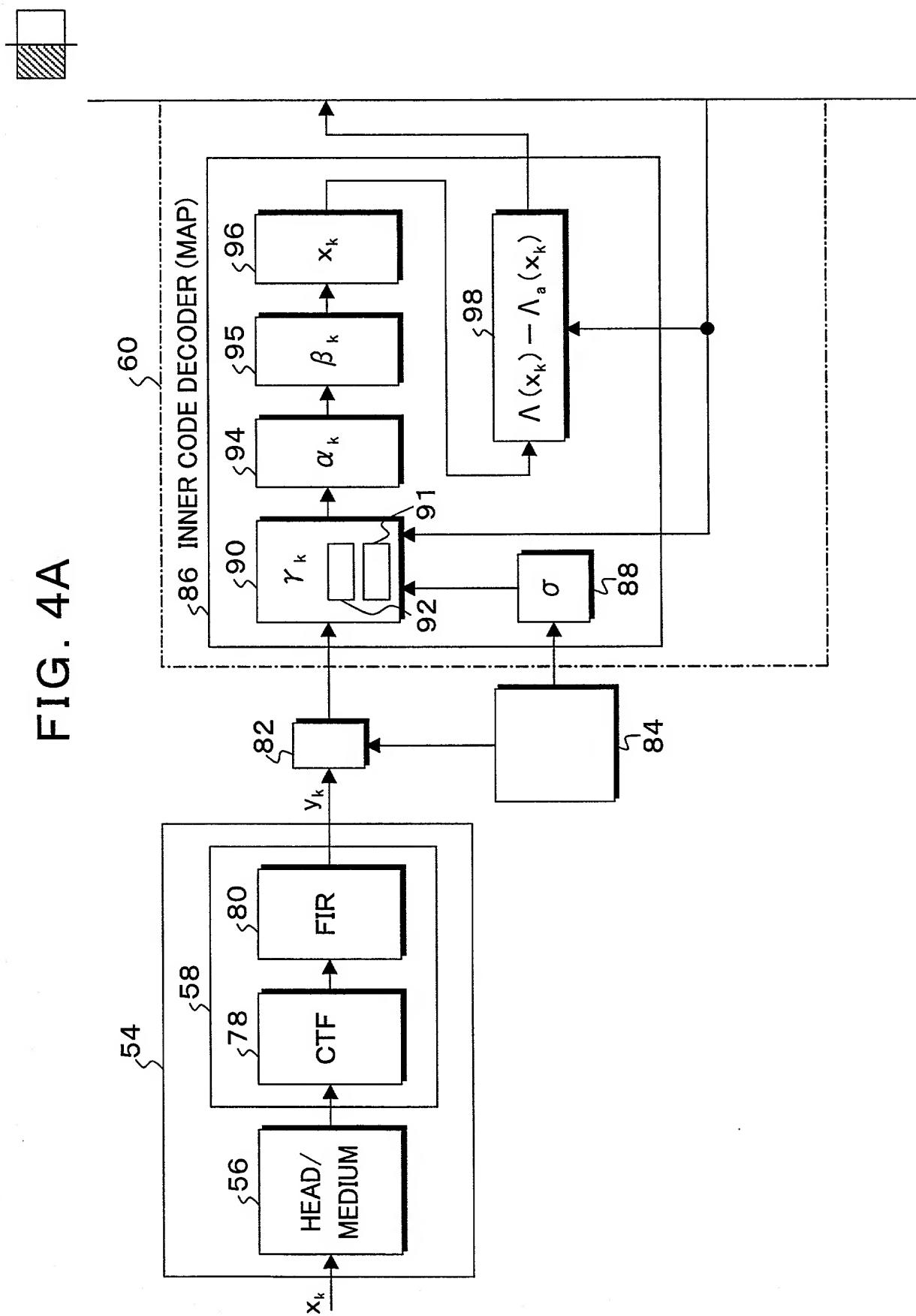


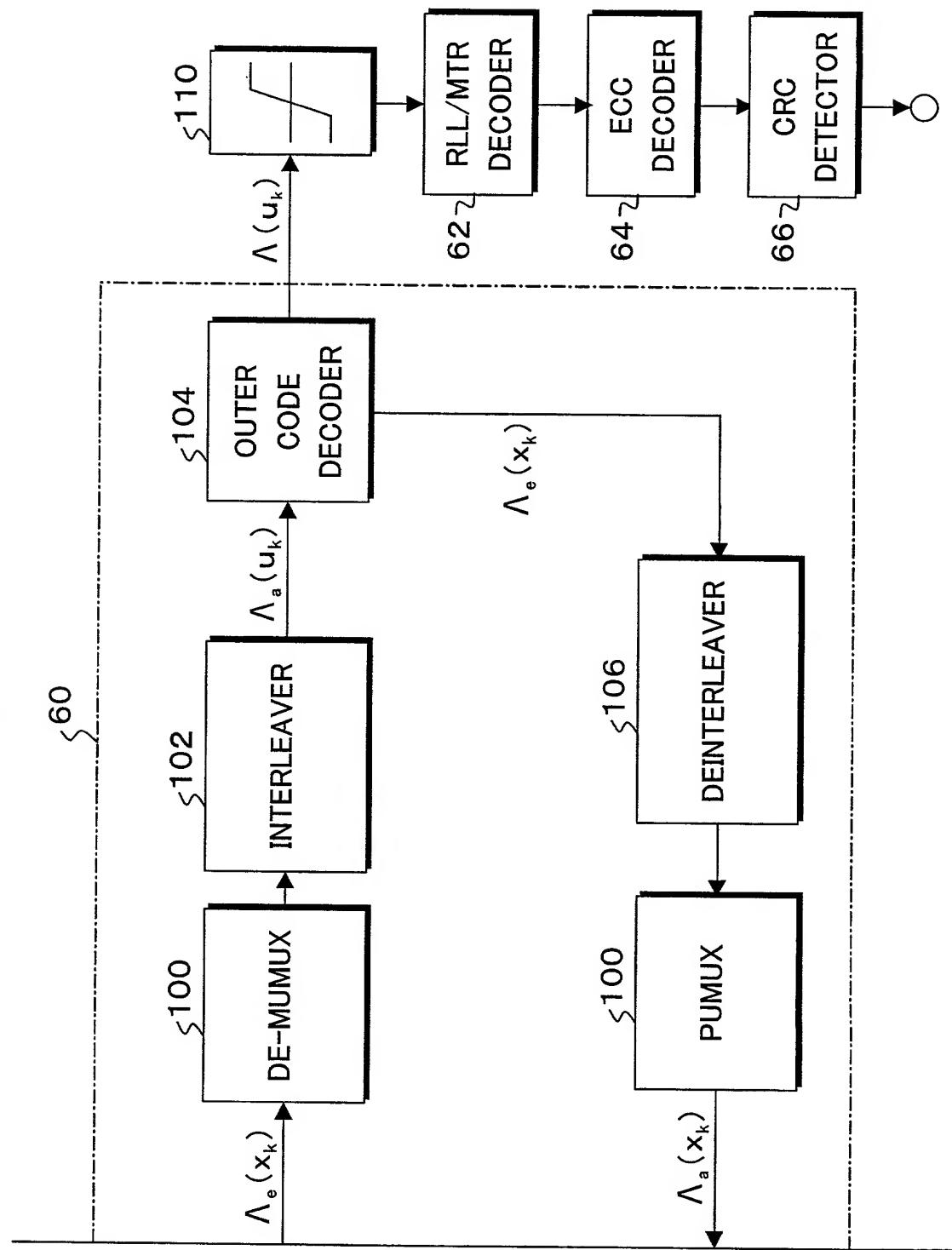
FIG. 4A



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FIG. 4B

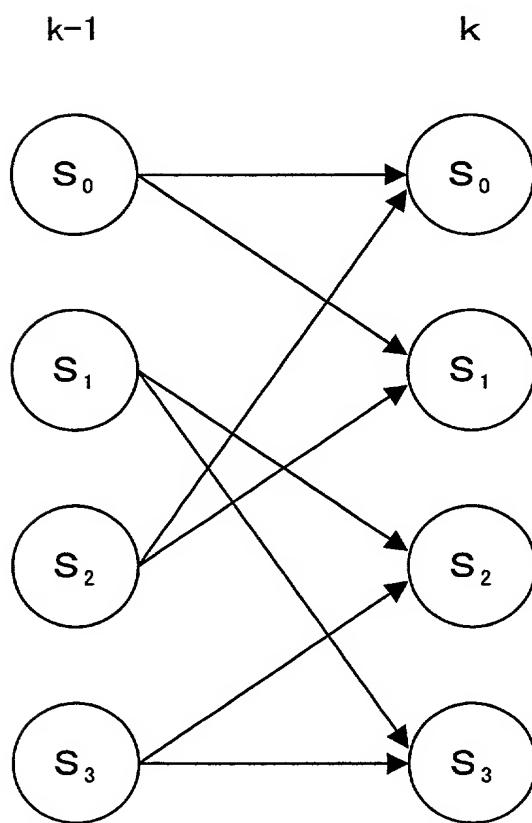


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FIG. 5

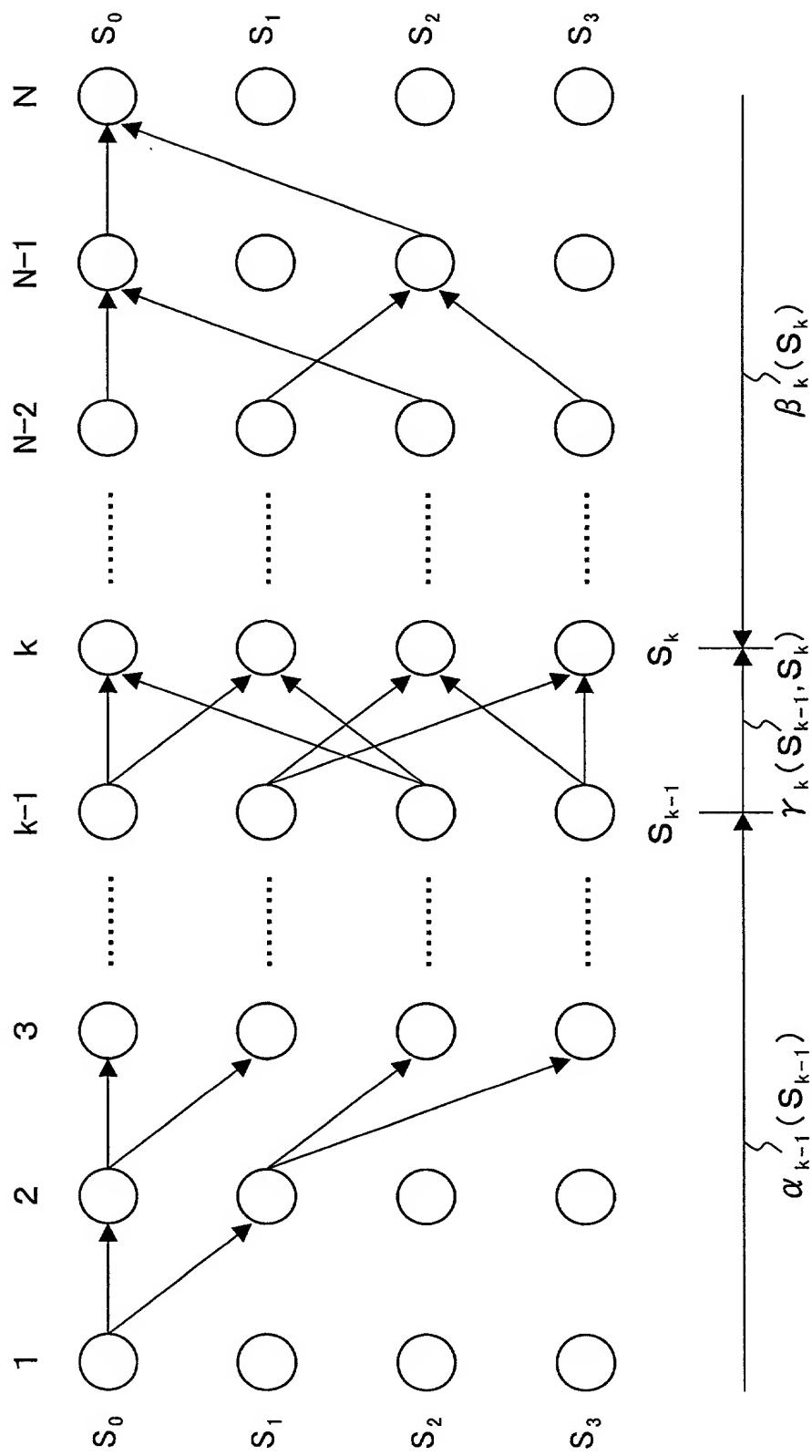
$x_{k-1}x_k$	$s_i$
00	$s_0$
01	$s_1$
10	$s_2$
11	$s_3$

FIG. 6



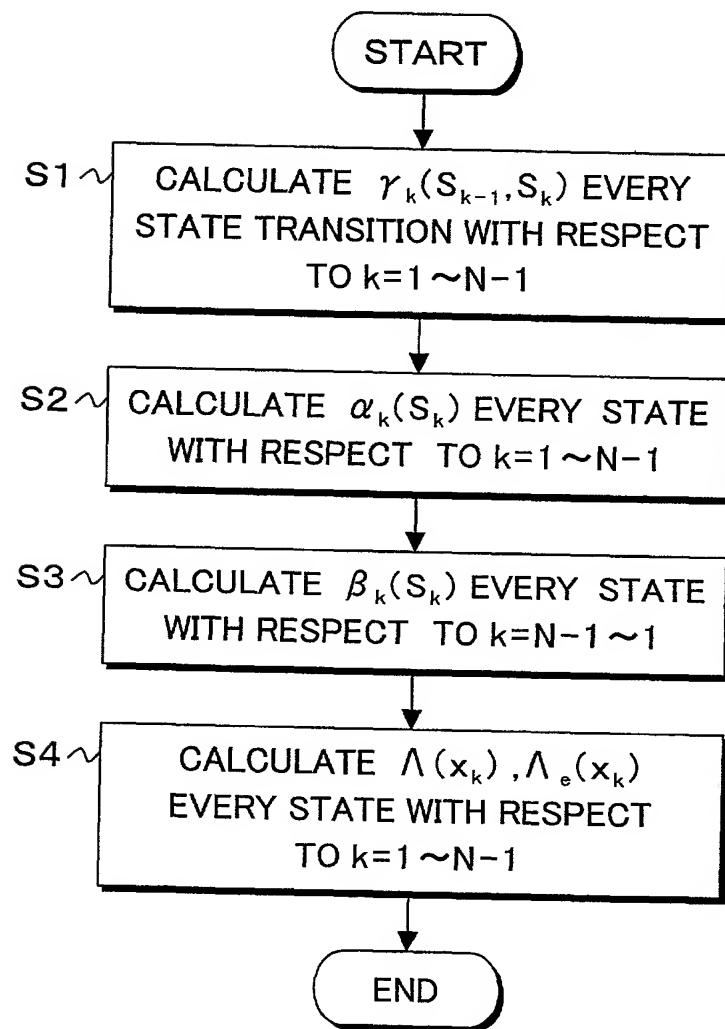
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FIG. 7



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## FIG. 8



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FIG. 9

RECORDING SIGNAL $x_k$ ON MEDIUM					MEAN VALUE OF WAVEFORM AFTER EQUALIZATION	
$x_{k-N}$	...	$x_{k-1}$	$x_k$	$x_{k+1}$	...	$x_{k+Q}$
0	...	0	0	0	...	0
0	...	0	0	0	...	1
...	...	...	...	...	...	...
1	...	1	1	1	...	0
1	...	1	1	1	...	1

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FIG. 10A

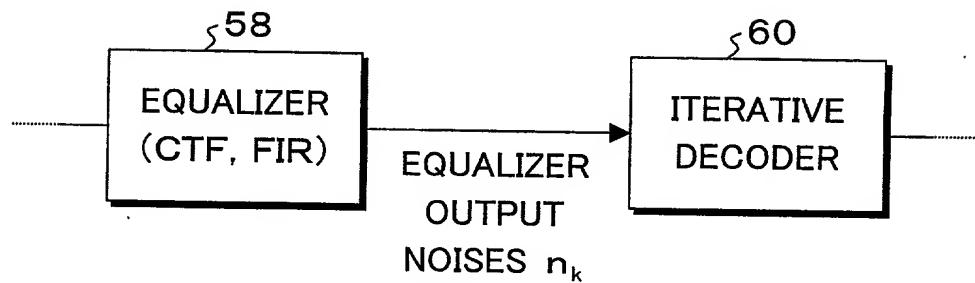


FIG. 10B

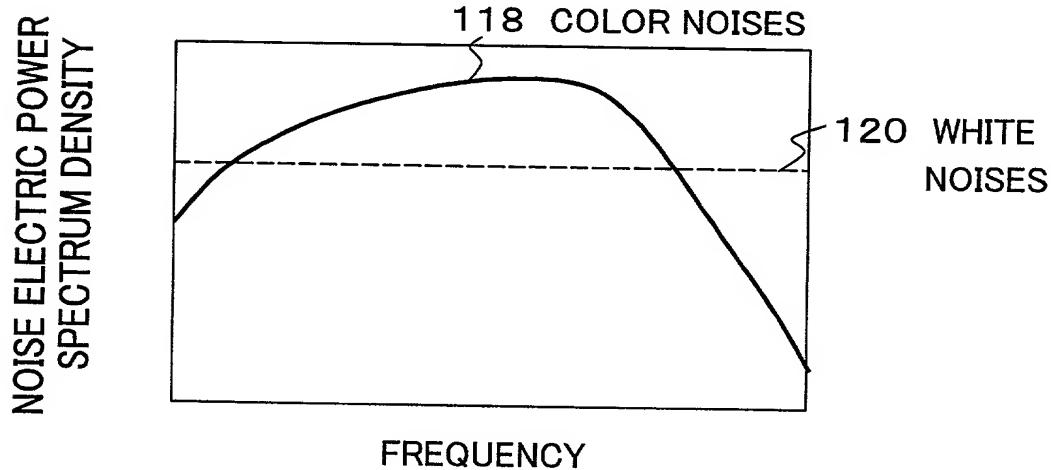
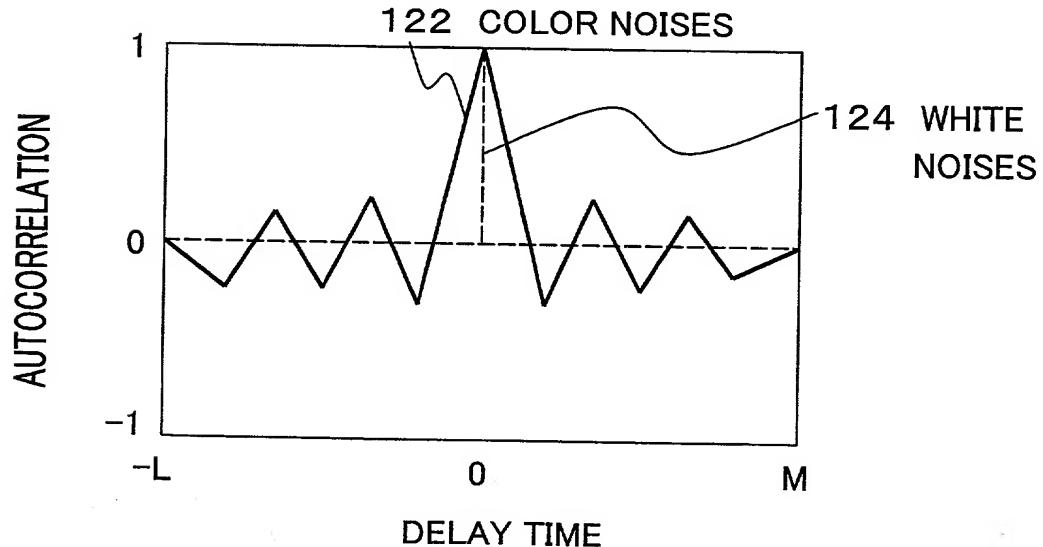


FIG. 10C



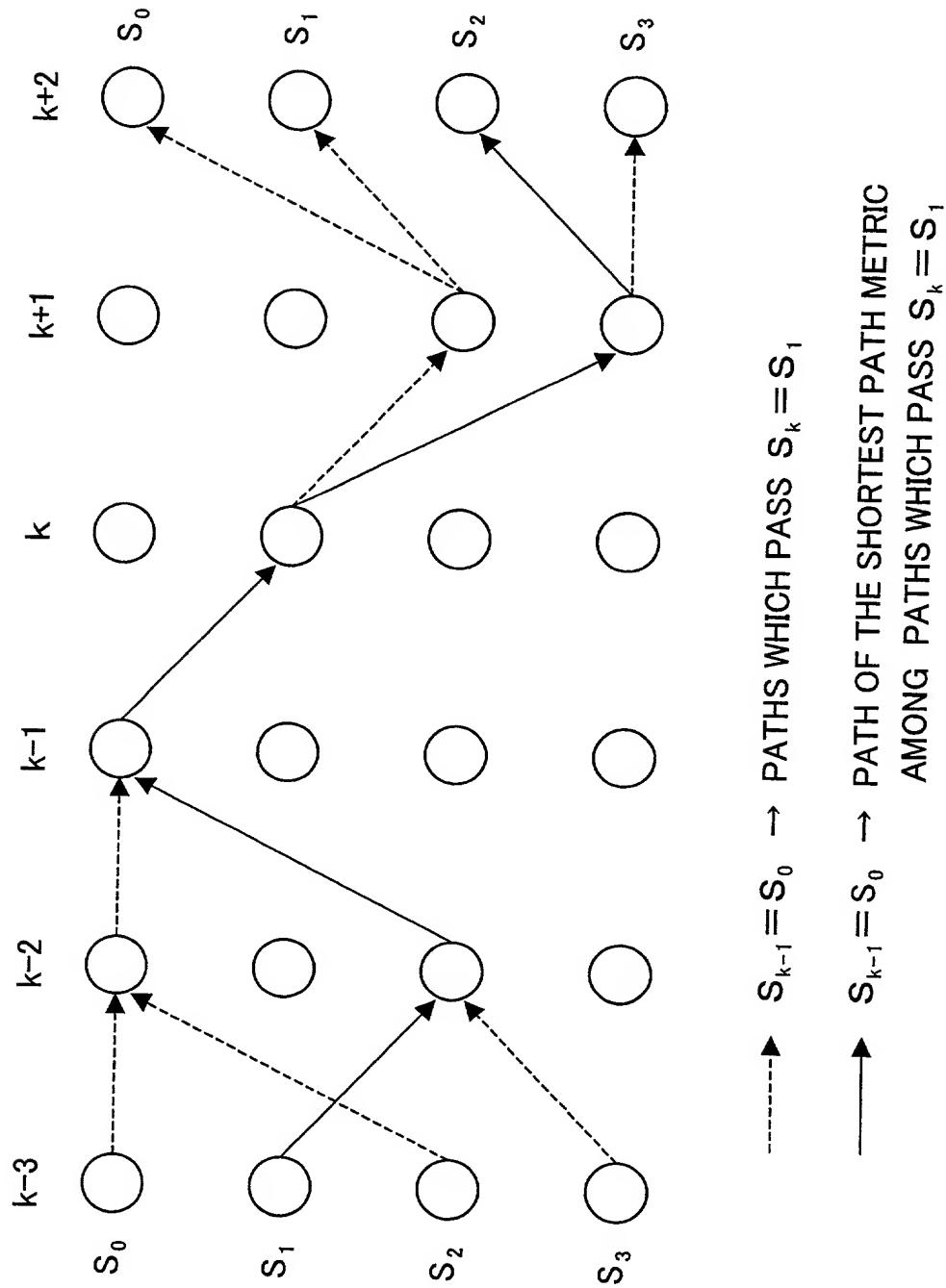
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FIG. 11

STATE	CORRELATION OF NOISES							STANDARD DEVIATION OF NOISES $\sigma(S^m_k)$
	$e_{-L}(S^m_k)$	...	$e_{-1}(S^m_k)$	$e_1(S^m_k)$	...	$e_M(S^m_k)$		
$S^m_0$	$e_{-L}(S^m_0)$	...	$e_{-1}(S^m_0)$	$e_1(S^m_0)$	...	$e_M(S^m_0)$		$\sigma(S^m_0)$
$S^m_1$	$e_{-L}(S^m_1)$	...	$e_{-1}(S^m_1)$	$e_1(S^m_1)$	...	$e_M(S^m_1)$		$\sigma(S^m_1)$
.....	.....	...	.....	...	...	.....	.....	.....
$S^m_{2^{[N+Q+1]-2}}$	$e_{-L}(S^m_{2^{[N+Q+1]-2}})$	...	$e_{-1}(S^m_{2^{[N+Q+1]-2}})$	$e_1(S^m_{2^{[N+Q+1]-2}})$	...	$e_M(S^m_{2^{[N+Q+1]-2}})$		$\sigma(S^m_{2^{[N+Q+1]-2}})$
$S^m_{2^{[N+Q+1]-1}}$	$e_{-L}(S^m_{2^{[N+Q+1]-1}})$	...	$e_{-1}(S^m_{2^{[N+Q+1]-1}})$	$e_1(S^m_{2^{[N+Q+1]-1}})$	...	$e_M(S^m_{2^{[N+Q+1]-1}})$		$\sigma(S^m_{2^{[N+Q+1]-1}})$

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FIG. 12



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FIG. 13

$\zeta_{126}$  PAST NOISES

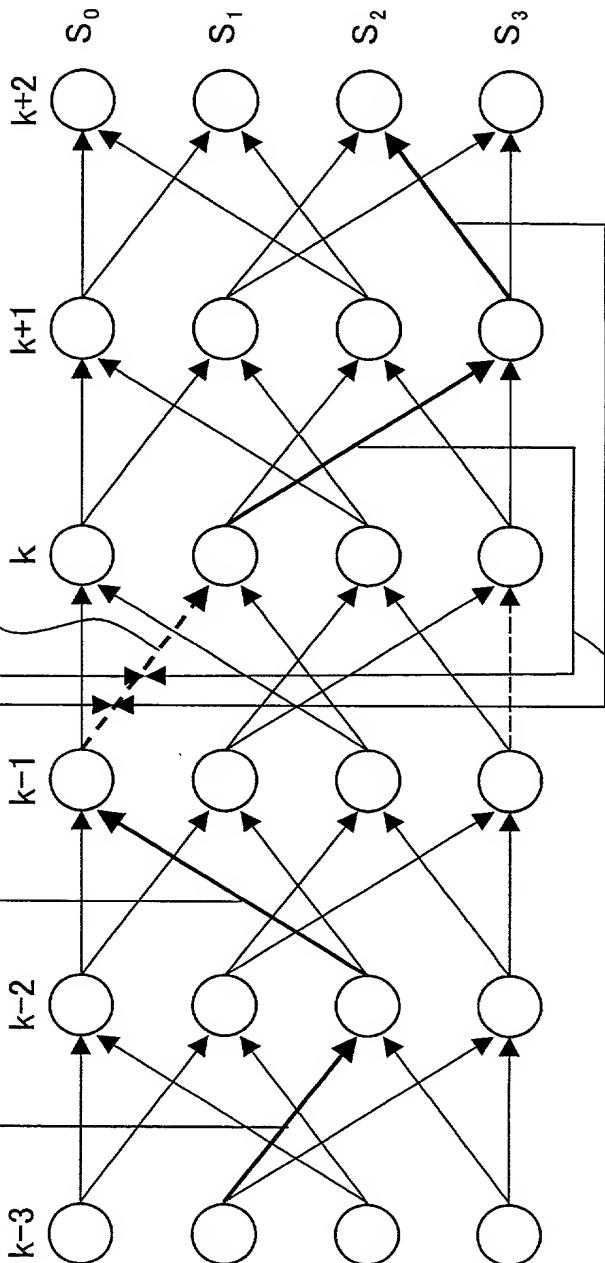
CORRELATION WITH NOISES OF 2 BITS BEFORE

$$e_{-2}(s_k^m)(y_{k-2}-d(s_{k-2}^m))$$

CORRELATION WITH NOISES OF 1 BIT BEFORE

$$e_{-1}(s_k^m)(y_{k-1}-d(s_{k-1}^m))$$

$\zeta_{128}$  NOISES AT PRESENT TIME



FUTURE NOISES

130 ~

$$e_1(s_k^m)(y_{k+1}-d(s_{k+1}^m))$$

$$e_2(s_k^m)(y_{k+2}-d(s_{k+2}^m))$$

CORRELATION WITH NOISES OF 1 BIT AFTER CORRELATION WITH NOISES OF 2 BITS AFTER

CHANNEL INFORMATION IN CASE OF REACHING  $s_k$  FROM  $s_{k-1}$

$$\Lambda c(y_k | s_k^m) = -\ln \sigma(s_k^m) - \frac{(y_k - d(s_k^m) - e_{-1}(s_k^m)(y_{k-1} - d(s_{k-1}^m)) - e_{-2}(s_k^m)(y_{k-2} - d(s_{k-2}^m)) - e_1(s_k^m)(y_{k+1} - d(s_{k+1}^m)) - e_2(s_k^m)(y_{k+2} - d(s_{k+2}^m)))^2}{2 \sigma^2(s_k^m)}$$

FIG. 14

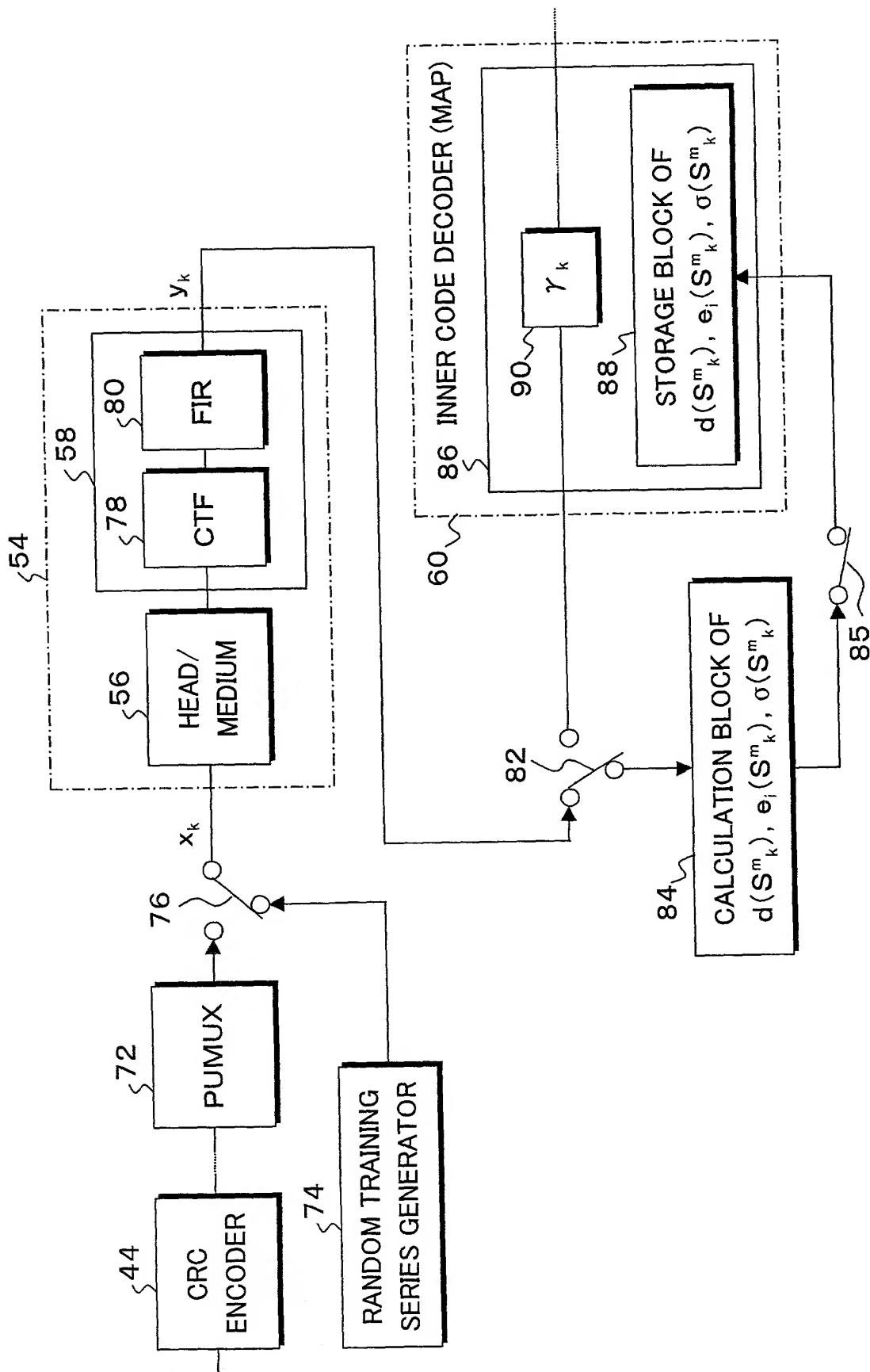
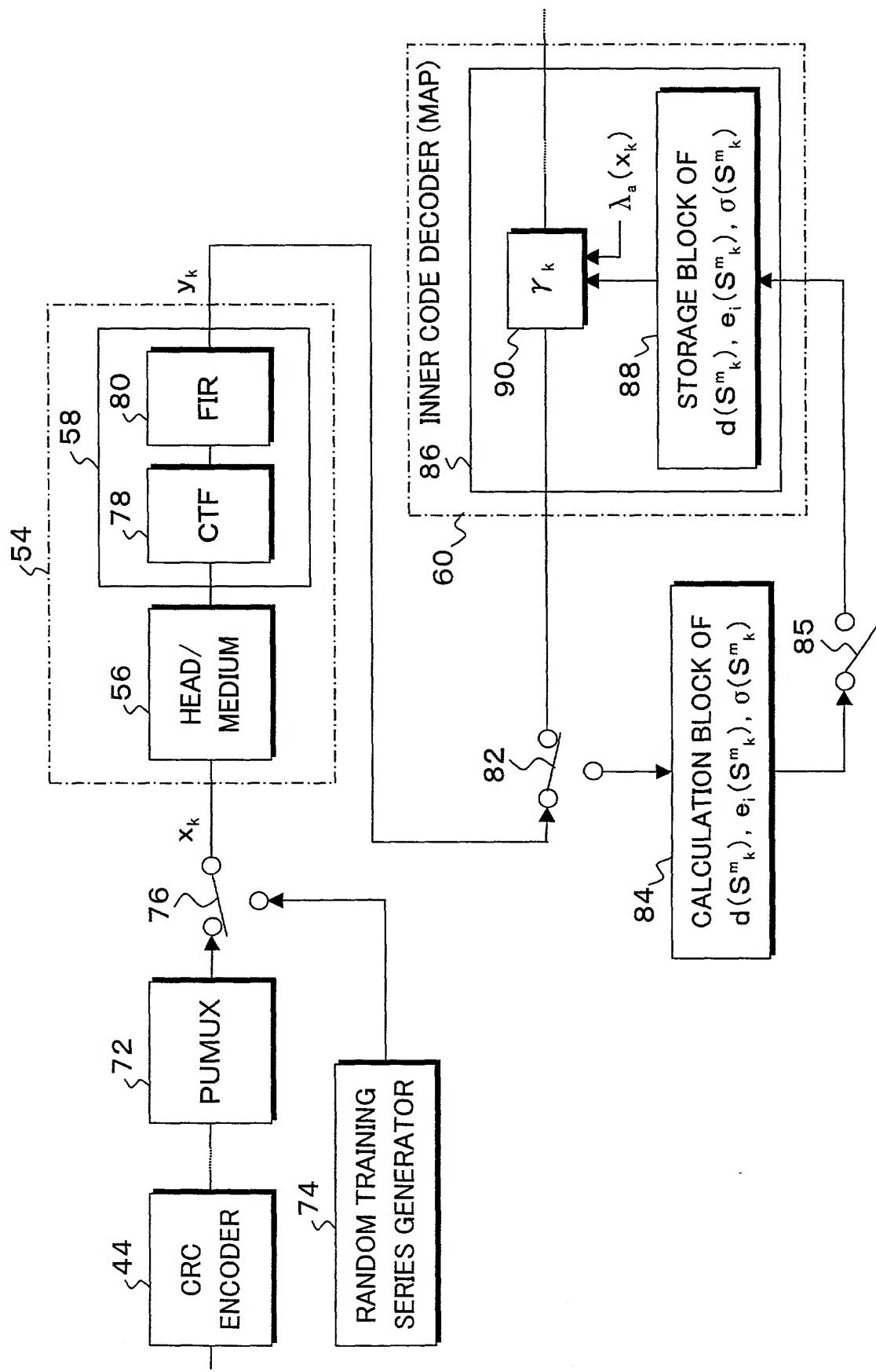
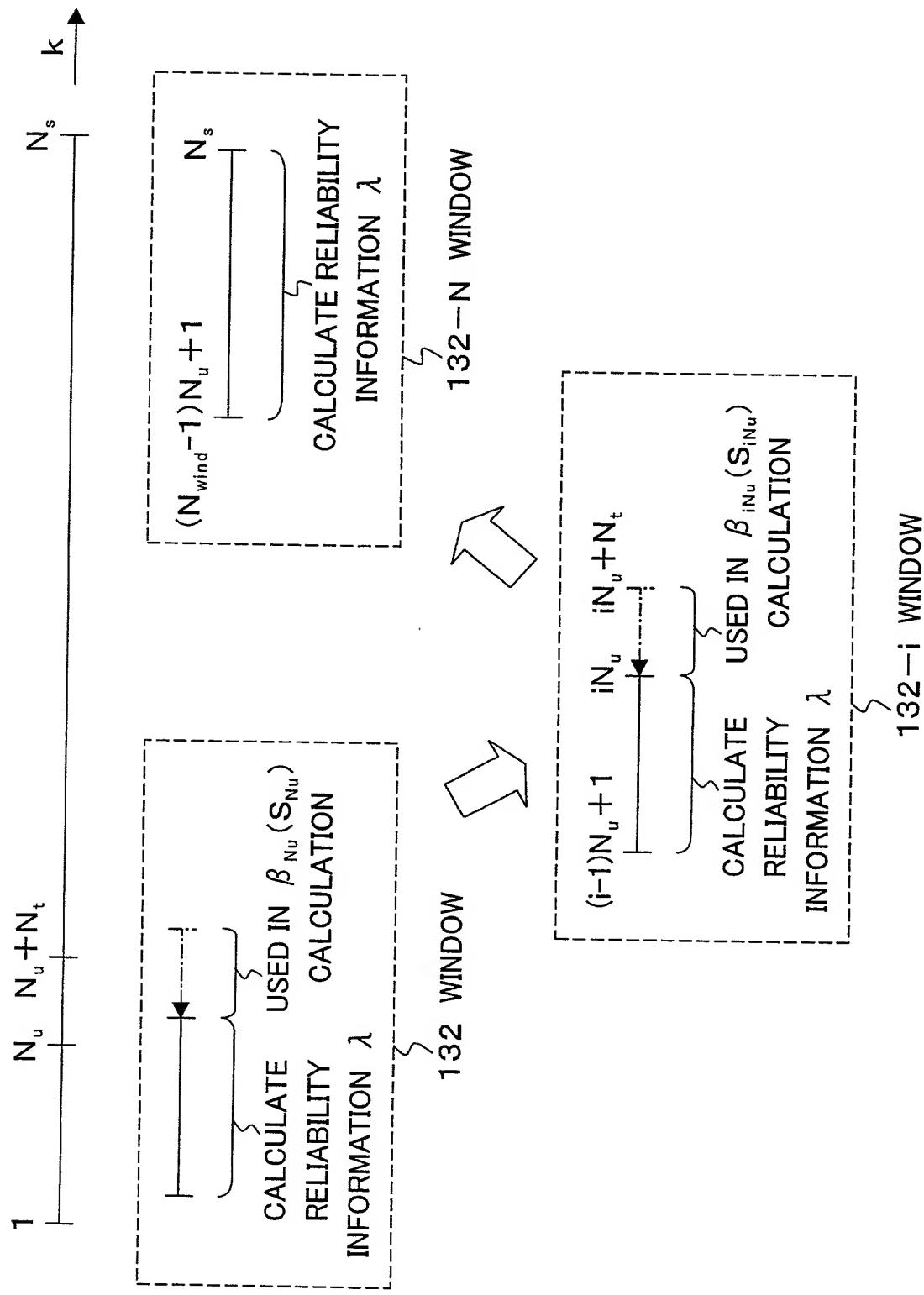


FIG. 15



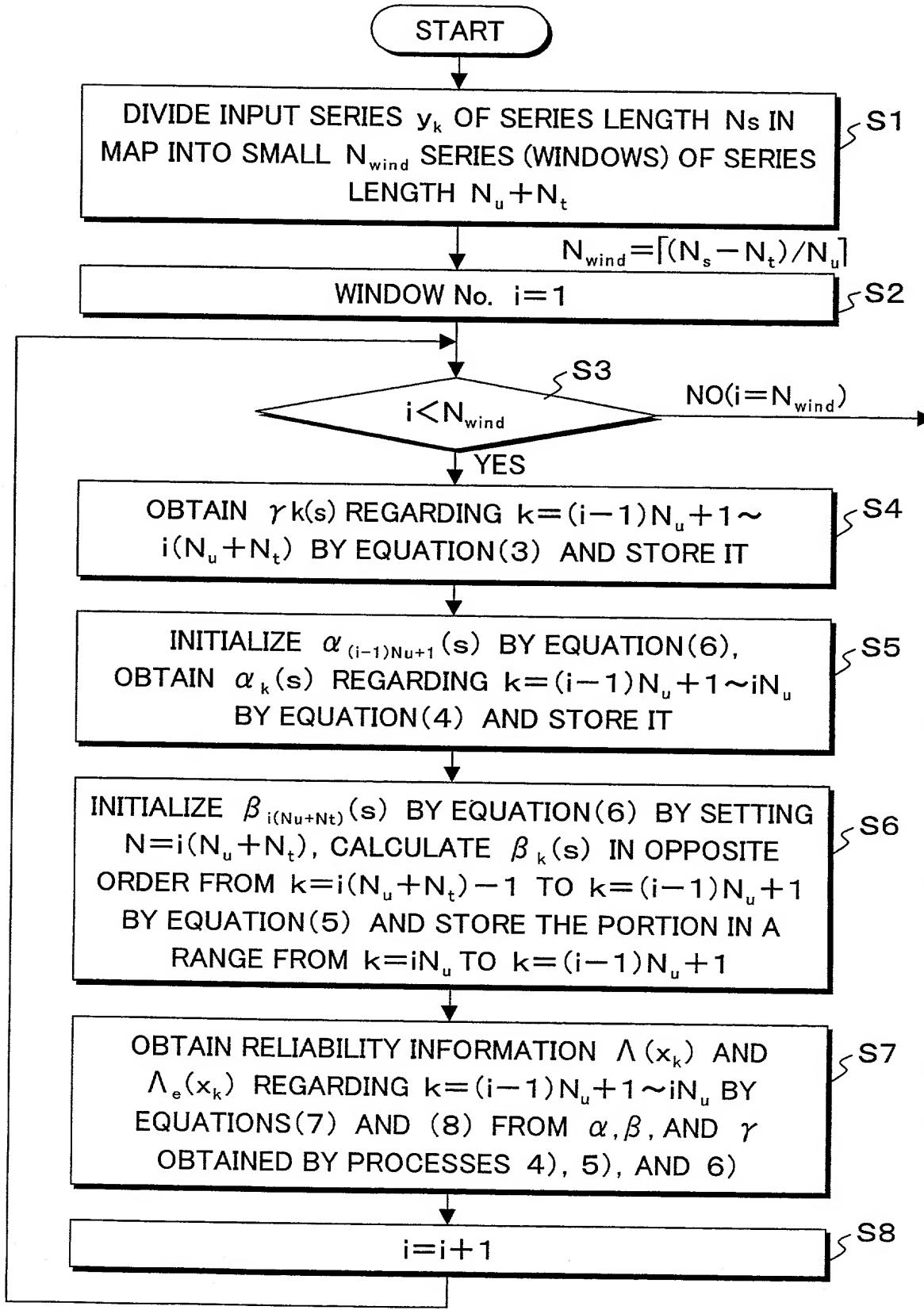
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FIG. 16

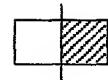


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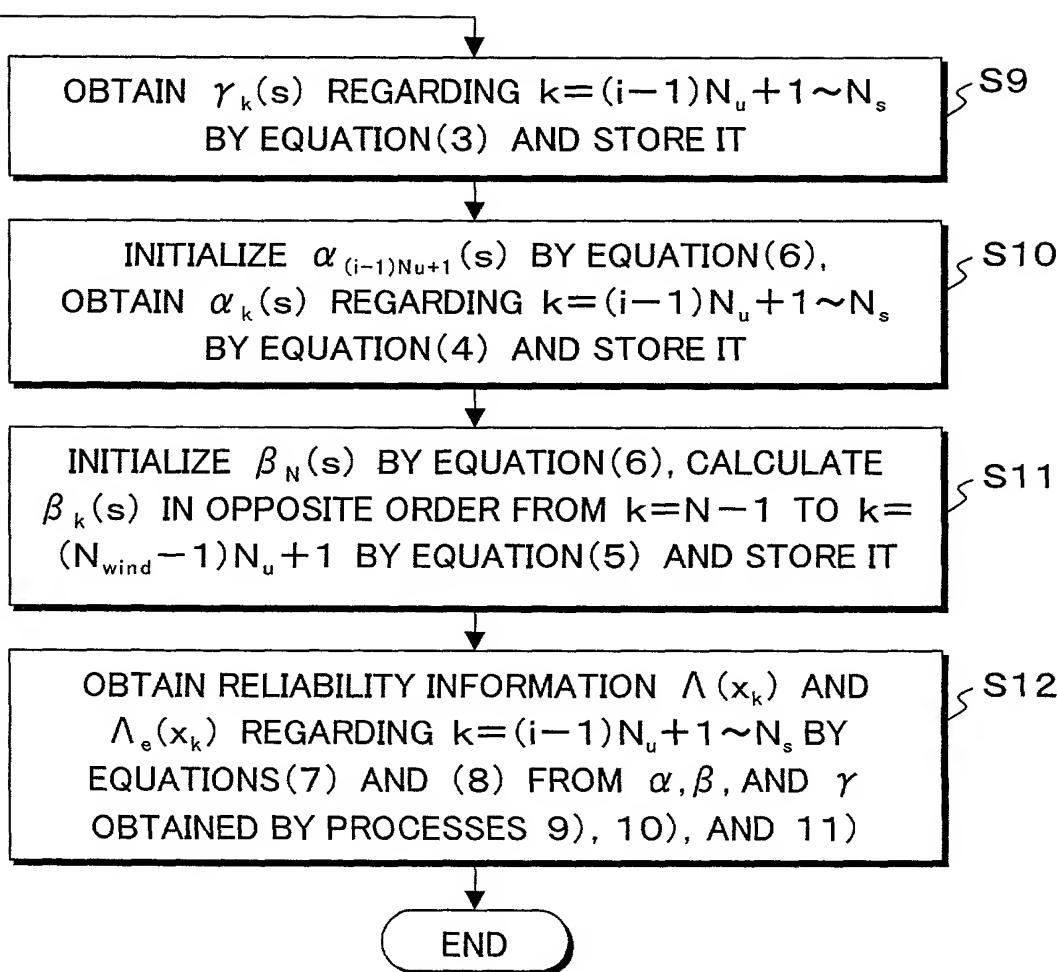
FIG. 17A



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## FIG. 17B



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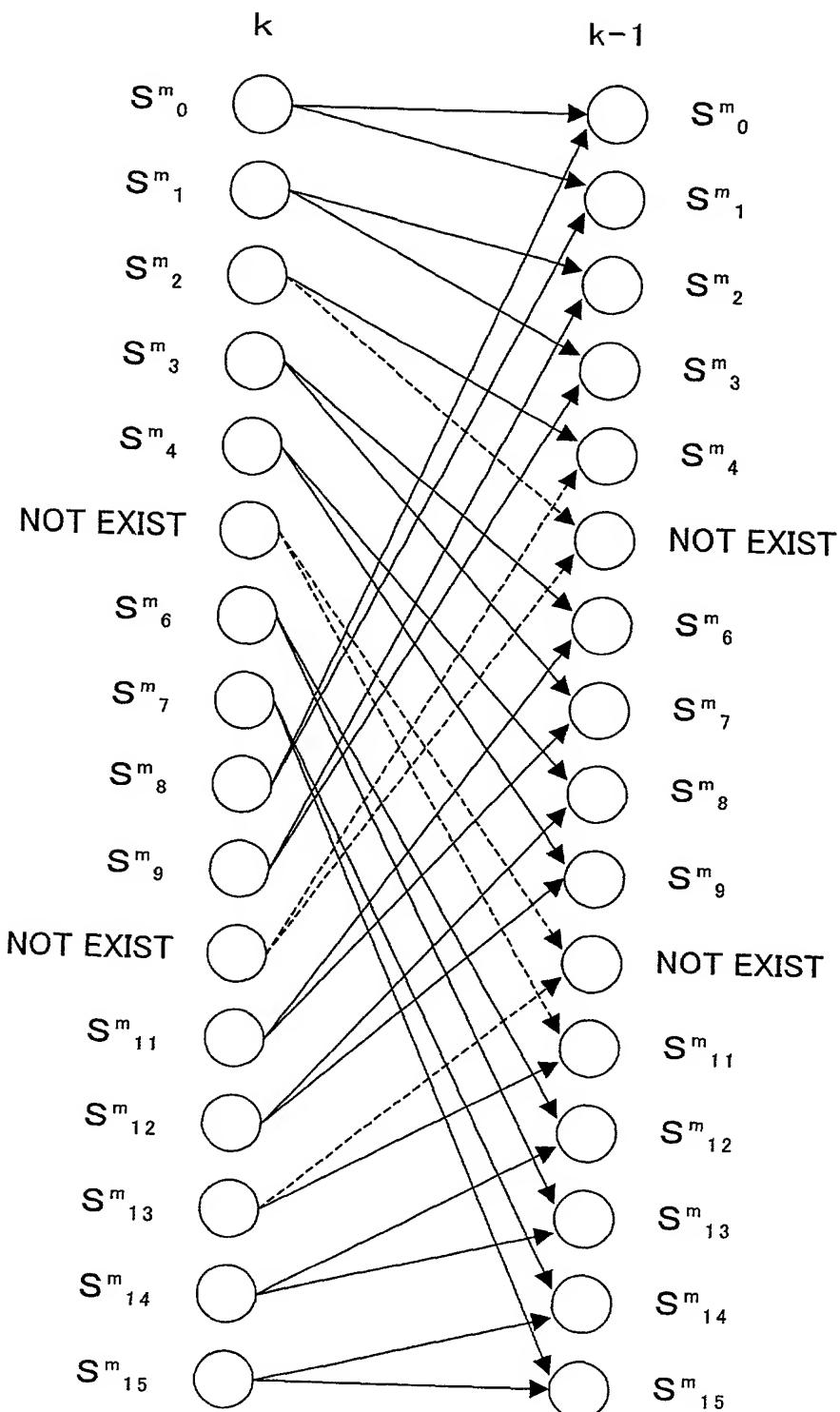
## FIG. 18

$x_{k-3}x_{k-2}x_{k-1}x_k$	STATE
0000	$S^m_0$
0001	$S^m_1$
0010	$S^m_2$
0011	$S^m_3$
0100	$S^m_4$
0101	NOT EXIST
0110	$S^m_6$
0111	$S^m_7$
1000	$S^m_8$
1001	$S^m_9$
1010	NOT EXIST
1011	$S^m_{11}$
1100	$S^m_{12}$
1101	$S^m_{13}$
1110	$S^m_{14}$
1111	$S^m_{15}$

10045336 102603

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FIG. 19



→ PATH WITH STATE TRANSITION  
---→ PATH WITHOUT STATE TRANSITION

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**FIG. 20**

STATE	CORRELATION OF NOISES															STANDARD DEVIATION OF NOISES	MEAN VALUE OF EQUALIZATION SIGNAL					
	$e_{-L}(S^m_k)$	...	$e_{-1}(S^m_k)$	$e_1(S^m_k)$	...	$e_M(S^m_k)$	$\sigma(S^m_k)$	$d(S^m_k)$														
$S^m_0$	$e_{-L}(S^m_0)$	...	$e_{-1}(S^m_0)$	$e_1(S^m_0)$	...	$e_M(S^m_0)$	$\sigma(S^m_0)$	$d(S^m_0)$	$e_{-L}(S^m_1)$	$e_{-1}(S^m_1)$	$e_1(S^m_1)$	...	$e_M(S^m_1)$	$\sigma(S^m_1)$	$d(S^m_1)$	$e_{-L}(S^m_2)$	$e_{-1}(S^m_2)$	$e_1(S^m_2)$	...	$e_M(S^m_2)$	$\sigma(S^m_2)$	$d(S^m_2)$
$S^m_1$	$e_{-L}(S^m_1)$	...	$e_{-1}(S^m_1)$	$e_1(S^m_1)$	...	$e_M(S^m_1)$	$\sigma(S^m_1)$	$d(S^m_1)$	$e_{-L}(S^m_2)$	$e_{-1}(S^m_2)$	$e_1(S^m_2)$	...	$e_M(S^m_2)$	$\sigma(S^m_2)$	$d(S^m_2)$	$e_{-L}(S^m_3)$	$e_{-1}(S^m_3)$	$e_1(S^m_3)$	...	$e_M(S^m_3)$	$\sigma(S^m_3)$	$d(S^m_3)$
$S^m_2$	$e_{-L}(S^m_2)$	...	$e_{-1}(S^m_2)$	$e_1(S^m_2)$	...	$e_M(S^m_2)$	$\sigma(S^m_2)$	$d(S^m_2)$	$e_{-L}(S^m_4)$	$e_{-1}(S^m_4)$	$e_1(S^m_4)$	...	$e_M(S^m_4)$	$\sigma(S^m_4)$	$d(S^m_4)$	$e_{-L}(S^m_6)$	$e_{-1}(S^m_6)$	$e_1(S^m_6)$	...	$e_M(S^m_6)$	$\sigma(S^m_6)$	$d(S^m_6)$
$S^m_3$	$e_{-L}(S^m_3)$	...	$e_{-1}(S^m_3)$	$e_1(S^m_3)$	...	$e_M(S^m_3)$	$\sigma(S^m_3)$	$d(S^m_3)$	$e_{-L}(S^m_7)$	$e_{-1}(S^m_7)$	$e_1(S^m_7)$	...	$e_M(S^m_7)$	$\sigma(S^m_7)$	$d(S^m_7)$	$e_{-L}(S^m_7)$	$e_{-1}(S^m_7)$	$e_1(S^m_7)$	...	$e_M(S^m_7)$	$\sigma(S^m_7)$	$d(S^m_7)$
$S^m_4$	$e_{-L}(S^m_4)$	...	$e_{-1}(S^m_4)$	$e_1(S^m_4)$	...	$e_M(S^m_4)$	$\sigma(S^m_4)$	$d(S^m_4)$	$e_{-L}(S^m_8)$	$e_{-1}(S^m_8)$	$e_1(S^m_8)$	...	$e_M(S^m_8)$	$\sigma(S^m_8)$	$d(S^m_8)$	$e_{-L}(S^m_9)$	$e_{-1}(S^m_9)$	$e_1(S^m_9)$	...	$e_M(S^m_9)$	$\sigma(S^m_9)$	$d(S^m_9)$
NOT EXIST	—	...	—	—	—	...	—	—	—	—	—	...	—	—	—	—	—	—	—	—	—	—
$S^m_6$	$e_{-L}(S^m_6)$	...	$e_{-1}(S^m_6)$	$e_1(S^m_6)$	...	$e_M(S^m_6)$	$\sigma(S^m_6)$	$d(S^m_6)$	$e_{-L}(S^m_7)$	$e_{-1}(S^m_7)$	$e_1(S^m_7)$	...	$e_M(S^m_7)$	$\sigma(S^m_7)$	$d(S^m_7)$	$e_{-L}(S^m_8)$	$e_{-1}(S^m_8)$	$e_1(S^m_8)$	...	$e_M(S^m_8)$	$\sigma(S^m_8)$	$d(S^m_8)$
$S^m_7$	$e_{-L}(S^m_7)$	...	$e_{-1}(S^m_7)$	$e_1(S^m_7)$	...	$e_M(S^m_7)$	$\sigma(S^m_7)$	$d(S^m_7)$	$e_{-L}(S^m_9)$	$e_{-1}(S^m_9)$	$e_1(S^m_9)$	...	$e_M(S^m_9)$	$\sigma(S^m_9)$	$d(S^m_9)$	$e_{-L}(S^m_11)$	$e_{-1}(S^m_{11})$	$e_1(S^m_{11})$	...	$e_M(S^m_{11})$	$\sigma(S^m_{11})$	$d(S^m_{11})$
$S^m_8$	$e_{-L}(S^m_8)$	...	$e_{-1}(S^m_8)$	$e_1(S^m_8)$	...	$e_M(S^m_8)$	$\sigma(S^m_8)$	$d(S^m_8)$	$e_{-L}(S^m_{12})$	$e_{-1}(S^m_{12})$	$e_1(S^m_{12})$	...	$e_M(S^m_{12})$	$\sigma(S^m_{12})$	$d(S^m_{12})$	$e_{-L}(S^m_{13})$	$e_{-1}(S^m_{13})$	$e_1(S^m_{13})$	...	$e_M(S^m_{13})$	$\sigma(S^m_{13})$	$d(S^m_{13})$
$S^m_9$	$e_{-L}(S^m_9)$	...	$e_{-1}(S^m_9)$	$e_1(S^m_9)$	...	$e_M(S^m_9)$	$\sigma(S^m_9)$	$d(S^m_9)$	$e_{-L}(S^m_{14})$	$e_{-1}(S^m_{14})$	$e_1(S^m_{14})$	...	$e_M(S^m_{14})$	$\sigma(S^m_{14})$	$d(S^m_{14})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$
NOT EXIST	—	...	—	—	—	...	—	—	—	—	—	...	—	—	—	—	—	—	—	—	—	—
$S^m_{11}$	$e_{-L}(S^m_{11})$	...	$e_{-1}(S^m_{11})$	$e_1(S^m_{11})$	...	$e_M(S^m_{11})$	$\sigma(S^m_{11})$	$d(S^m_{11})$	$e_{-L}(S^m_{12})$	$e_{-1}(S^m_{12})$	$e_1(S^m_{12})$	...	$e_M(S^m_{12})$	$\sigma(S^m_{12})$	$d(S^m_{12})$	$e_{-L}(S^m_{13})$	$e_{-1}(S^m_{13})$	$e_1(S^m_{13})$	...	$e_M(S^m_{13})$	$\sigma(S^m_{13})$	$d(S^m_{13})$
$S^m_{12}$	$e_{-L}(S^m_{12})$	...	$e_{-1}(S^m_{12})$	$e_1(S^m_{12})$	...	$e_M(S^m_{12})$	$\sigma(S^m_{12})$	$d(S^m_{12})$	$e_{-L}(S^m_{14})$	$e_{-1}(S^m_{14})$	$e_1(S^m_{14})$	...	$e_M(S^m_{14})$	$\sigma(S^m_{14})$	$d(S^m_{14})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$
$S^m_{13}$	$e_{-L}(S^m_{13})$	...	$e_{-1}(S^m_{13})$	$e_1(S^m_{13})$	...	$e_M(S^m_{13})$	$\sigma(S^m_{13})$	$d(S^m_{13})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$
$S^m_{14}$	$e_{-L}(S^m_{14})$	...	$e_{-1}(S^m_{14})$	$e_1(S^m_{14})$	...	$e_M(S^m_{14})$	$\sigma(S^m_{14})$	$d(S^m_{14})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$
$S^m_{15}$	$e_{-L}(S^m_{15})$	...	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$	$e_{-L}(S^m_{15})$	$e_{-1}(S^m_{15})$	$e_1(S^m_{15})$	...	$e_M(S^m_{15})$	$\sigma(S^m_{15})$	$d(S^m_{15})$